Samples collected 3/15/95

14 August 1995

Yaquina Bay and South Beach Marina Sediment Evaluations

Abstract

Sediment from the main Federal Channel in Yaquina Bay and from the side channel into South Beach Marina is acceptable for in-water and upland disposal according to requirements of the MPRSA and CWA.

Introduction

1. Yaquina Bay is located 115 miles south of the mouth of the Columbia River. The bay forms the fifth largest estuary in Oregon (7). It is fed by the Yaquina River and other streams which drain an area of 253 square miles. These tributaries deposit about 30 to 50 thousand tons of sediment annually into the estuary (9). Some littoral drift also distributes sediment from the ocean to the mouth of the bay (10).

2. The dimensions of the Federal Channel from the mouth to the turning basin are as follows: the entrance channel is 40 feet deep and 400 feet wide from RM -1.2 to RM 0.0, from RM 0.0 to RM 2.0 it is 300 feet wide and gradually reduces to 30 feet deep, and from RM 2.0 to 2.4 the channel widens to a pear shaped turning basin 900 feet to 1,200 feet wide and 1,400 feet long. Also included as a side part of the Federal Channel is the channel into South Beach Marina that is 10 feet deep, 100 feet wide, and 2,035 feet long.

3. Potential sources of contaminants to the Federal Channel are logging, wood processing, fish processing and urban runoff. Over the years sediment studies have shown that bay and river sediment is typically low in concentrations of contaminants of concern (1- 3, 8-9). The Federal Navigation Channel has never showed elevated contaminants of concern. Consequently, sediment from the Navigation Channel has been acceptable for in-water ocean disposal at the local Ocean Dredged Material Disposal Site (ODMDS). Studies of more backwater areas such as South Beach Marina and the docks at the city of Newport have shown somewhat elevated levels of contaminants (1, 9). This is expected since finer grained sediment, rich in organic matter, tends to adsorb contaminants. Still, most contaminants were below established concern levels. Fine grained, South Beach Marina sediment has passed bioassay tests for toxicity, thus allowing for in-water disposal (8).

4. Portland District routinely evaluates sediment from its projects on a 5-year rotation. The last evaluation of Yaquina Bay sediment was performed in April of 1990. Accordingly, in March of 1995 new sediment samples were taken to determine current sediment quality in the Federal Navigation Channel and the side channel at South Beach Marina.

5. This sediment evaluation covers the Federal Channel from the mouth to the end of the turning basin at River Mile (RM) 2.5. The Federal Channel actually extends as far upriver as Toledo, Oregon, a distance of about 14 miles. Traditionally, the Corps has conducted separate evaluations for the bay and river portions of the channel. A sediment evaluation of the river portion was completed in April of 1994 (3).

Study Methods

6. Study methods followed procedures outlined in the "Green Book", titled Evaluation of Dredged Material Proposed for Ocean Disposal (Testing Manual) and the Inland Testing Manual developed jointly by the EPA and U. S. Army Corps of Engineers (11, 12). The manuals

describe methods for collecting, handling, processing, storing, and analyzing samples. The manuals were closely followed in these matters. Details of sample handling and processing as required by these manuals are described in numerous previous sediment evaluation reports prepared by this office. The manuals also describes proper procedures for evaluating the results of physical, chemical, and biological testing of sediment in relation to regulations developed to implement the Marine Protection Research and Sanctuaries Act (MPRSA) and the Clean Water Act (CWA) which govern ocean and inland waterways disposal of dredged material. The manuals only address the technical requirements that apply to contaminant evaluation.

7. A total of seven sediment samples were taken from various locations in the Federal Channel and South Beach Marina as shown on the map (Figure 1). A Gray O'Hare, 0.095 cubic meter, grab sampler was used to obtain these sediment samples for analysis. Two of the seven samples were taken in the South Beach Marina channel. Since this sediment is silty and organically rich, both samples were subjected to physical and chemical analyses. Five of the seven samples were taken between the mouth and the turning basin in the main Federal Channel. Sediment from the main Federal Channel is sandy and typically free of contaminants. Because of this only one sample, taken in the turning basin where the sediment is finer grained, was subjected to physical and chemical analyses.

8. Physical analysis of the samples was performed by the U. S. Army Corps of Engineers Materials Laboratory located in Troutdale, Oregon. Dredge tests were run on each sample. these tests measure, grain size distribution, volatile solids, void ratio, resuspended density, specific gravity, and particle roundness. Only the first two measures will be discussed in this report as the others are more useful for dredge contracting purposes.

9. Chemical analyses were performed on the samples by Columbia Analytical Associates, Kelso, Washington. Samples were analyzed for 8 metals, 19 pesticides, 7 PCB arochlors, 18 PAHs, 14 phenols, butyltins, AVS, and TOC. A brief quality assurance (QA) report on the CAS chemical data was prepared by chemists from the Materials Laboratory. That QA report is included in the raw data in the Appendix to this sediment evaluation. According to the report, all chemical data are acceptable. Measurements of AVS should be considered low estimates because the data were below laboratory established quality control limits.

10. The physical and chemical data acquired in the current study and data from previous studies were used to arrive at a conclusion regarding the acceptability for in-water disposal at the ocean ODMDS. The Tiered Testing Procedures established in the "Green Manual" and "Inland Testing manual" were used to determine the acceptability of sediment for disposal. The Tiered Testing Procedures establish a framework for predicting whether toxic effects will result from disposal of sediment.

Results

11. As expected, Federal Channel sediment is sandy material except for the shoal in the northeastern side of the turning basin (sample YB-1) which is predominantly silt (Table 1). This silty sample, YB-1, was analyzed for contaminants. Metals, pesticides, PCBs, PAHs, TBT and phenols were all well below established concern levels (Tables 2 and 3). Two of the samples, YB-3 and YB-4 contained some gravel and oyster shell hash. These samples are outside the edge of oyster beds that contribute shell hash to the channel.

12. South Beach Marina sediment samples are silty sand with some clay (Table 1). The organic content (volatile solids Table 1) is higher than in Federal Channel sediment. Contaminants in the two South Beach Marina samples were below concern levels for metals, pesticides, PCBs, PAHs, TBT and phenols. The organic and contaminant content of these samples is similar to that of the Federal Channel sample in the turning basin.

Discussion

MPRSA Evaluation

Yaquina Bay

13. The dredge material from the Federal Project in Yaquina Bay and from the side channel at South Beach Marina were subjected to MPRSA evaluations using the "Green Book " mentioned in the introduction. The "Green Book" describes a Tiered Testing Procedure for evaluating the acceptability of dredged material for disposal. There are four Tiers of analysis applied to the dredged material. One only needs to proceed through the Tiers until a decision can be reached regarding acceptability in terms of sediment toxicity. Tier I allows a decision to be made based on existing information. The other Tiers require further analysis of dredged material before a decision is reached.

14. A Tier I evaluation shows that dredge material from the main Federal Channel, between RM -1.2 to 2.4, meets the exclusionary criteria of the regulations (40 CFR, 227.13) developed to implement the MPRSA and is acceptable, in terms of contaminant concerns, for in-water disposal at the ODMDS. This material is predominantly sand from a high energy area, is similar to disposal site material, and is free of contaminants. Past sediment evaluations conducted in 1980, 86 and 90 of the Federal Channel and in 1985 of the ODMDS support this conclusion (2, 9, 14).

South Beach Marina

15. A Tier I evaluation also shows that South Beach Marina sediment is acceptable for in-water disposal. Tier I allows for determining compliance based on an evaluation of existing information. There are three previous studies of sediment quality in the vicinity of South Beach Marina and three studies of material from South Beach Marina itself, including the current study, that provide enough existing information for determining compliance. The Tiered Testing Procedure in the "Green Book" utilizes the concept of the limiting permissible concentration (LPC). LPCs are defined for the liquid, suspended and solid phases of dredged material. The LPC for the liquid phase (water column) is defined as the concentration, that after allowance for initial mixing, does not exceed the appropriate water quality criterium (WQC). If Synergism is expected or the WQC is not known, then the LPC is 0.01 of the acutely toxic concentration as determined by bioassay. The LPC for the suspended particulate and solid phase (ie whole sediment) is the concentration that will not cause unreasonable toxicity or bioaccumulation.

16. The Tier I evaluation shows that South Beach Marina sediment does not meet the exclusionary criteria. However it does meet all aspects of the limiting permissible concentrations (LPCs) for the water column, suspended, and solid phases and therefore, is acceptable for in-water disposal. The rational for this conclusion is based on existing data relating to bulk sediment concentrations, elutriate tests, bioassay results and reasonable assumptions regarding predicted water column concentrations in the mixing zone at the disposal site.

17. Existing bulk sediment and bioassay data show that the LPC for benthic toxicity is not exceeded. Bulk sediment studies have revealed that Yaquina Bay sediment is below concern levels for metals, PAHs, pesticides, PCBs, phenols and TBT. These studies were conducted in 1980, 1986, and 1990 in addition to the current data collected in 1995 (2, 9, 14). The one exception was an anomalous TBT measurement which will be discussed later with bioassay test data. Because established concern levels are not exceeded by bulk chemistry data it is doubtful

that the solid phase LPC is exceeded. Bioassay data yet to be discussed will support this conclusion.

18. Elutriate test data support the conclusion that liquid and suspended phase LPCs are not exceeded for South Beach Marina sediment. The data is from Yaquina Bay and Winchester Bay sediment samples that are close to South Beach Marina sediment in grain size, organic content and concentrations of contaminants. Elutriate data from nearby Yaquina Bay sediment (RM 2.0) was collected by the U. S. G. S. in 1980 (6). The data show that no contaminants of concern exceeded WQCs (Table 4). Elutriate data on metals in Winchester Bay sediment lend some support to the idea that South Beach Marina sediment meets the liquid phase LPC. The elutriate tests show that metals do not exceed WQCs (Table 4). These elutriate results from nearby Yaquina Bay sediment and from very similar Winchester Bay sediment, provide evidence that it is extremely doubtful that South Beach Marina sediment exceeds the water column and suspended phase LPCs. The Portland District has found that most fine-grained, estuarian sediment samples along the Oregon coast fit this pattern of low elutriate concentrations. Elutriate tests are very harsh in that they tend to over predict the concentrations that would result from ocean disposal. Typically, sediment released from a hopper dredge drops onto the disposal site as a cohesive mass with little mixing occurring.

19. Bioassay data are the most important support for South Beach Marina sediment meeting the LPCs required by the regulations. In a 1990 study of South Beach Marina sediment, a high TBT value (278 ppb) was obtained in one sample (2). All other contaminants were similar in concentration to those in the current 1995 samples. Because of the TBT value, "Green Book", Tier III Bioassays were conducted on sediment samples from the marina. No unacceptable mortalities were observed in solid phase tests using the amphipod Rhepoxynius abronius and the worm Neanthes sp. The same was true of the oyster larva, Crassostrea giga, in suspended phase tests. The information obtained from these bioassay tests combined with existing bulk sediment and elutriate test data show that South Beach Marina sediment meets all aspects of LPCs for the water column, suspended phase and solid phase. According to the "Green Book" Tiered Testing Procedure, the sediment is acceptable for in-water disposal at the ODMDS.

CWA Evaluation

21. The CWA 404 (b) (1) guidelines are used to determine acceptability of sediment for disposal. Technical guidance for the 404 (b) (1) evaluation is provided in the Inland Testing Manual developed by the EPA and Corps (12). The manual essentially follows the procedures in the "Green Book" used in MPRSA evaluations. The main difference is that the material is evaluated for WQC compliance at the mixing zone of a riverine disposal site versus an ocean site. Similarly, benthic impacts can be evaluated based on results of case-specific toxicity tests, such as the bioassay results described for South Beach Marina in the MPRSA evaluation. The same arguments mentioned above in the MPRSA evaluation are applicable to the CWA evaluation. Based on these arguments, the main Federal Channel in Yaquina Bay and South Beach Marina sediments are acceptable for both in-water and upland disposal.

Conclusions

22. Contaminant evaluation studies show that sediment from the main Federal Channel in Yaquina Bay and sediment from the side channel into South Beach Marina are acceptable for in-water disposal according to MPRSA and CWA requirements. Materials from both channels are also acceptable for upland disposal according to CWA requirements. State 401 water quality certification should be obtainable for disposal operations since water quality standards are not expected to be exceeded in freshwater or marine mixing zones.

References

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Table 1. Results of physical analyses of Yaquina Bay and South Beach Marina sediment.

sample	median grain size mm	gravel	sand	silt	clay	volatile solids
				%		
Yaquina Bay						
YB-1	0.03	-	33.9	53.7	13.2	7.2
YB-2	0.23	-	99.5	0.5	-	0.7
YB-3*	0.34	21.00	77.0	1.8	-	1.2
YB-4*	0.20	17.20	81.8	0.2	-	0.7
YB-5	0.18	-	99.7	0.3	-	0.9
South Beach M						
YSB-1	0.07	-	55.3	35.3	9.4	8.5
YSB-2	0.15	-	75.4	18.3	6.3	3.6

* These samples also contained oyster shell hash.

Table 2. Concentrations of metals, AVS and TOC in Federal Channel and South Beach Marina sediment.

sample	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	AVS	TOC
					(ppm)					(%)
Yaquina Bay										
YB-1	9.1	0.27	45.0	21.8	9.17	0.06	40.2	65.0	340	4.10
South Beach M										
YSB-1	8.4	0.45	46.2	20.8	8.98	0.05	40.6	84.3	2800	3.80
YSB-2	5.3	0.30	24.4	12.3	5.23	0.03	18.5	49.5	210	1.83
SL*	57	0.96	180	81	66	0.21	140	160	NA	NA

* EPA, Region 10 screening level for marine waters in Puget Sound.

Table 3. Concentrations of organic contaminants in Federal Channel and South Beach Marina sediment.

sample	4,4'-DDT	PCBs*	Phenanthrene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	TBT	Phenol
	(ppb)									
Yaquina Bay										
YB-1	<2	<1	28	37	28	<20	<20	<20	10	34
South Beach M										
YSB-1	4	<5	40	160	97	30	34	26	<4	<20
YSB-2	<2	<3	20	74	52	<20	23	<20	5	27
SL*	6.9	130	320	630	430	450	670	800	30	120

* EPA, Region 10 screening level for marine waters in Puget Sound.

le 4. Elutriate results from sediments similar to South Beach Marina in grain size, metals and organics.

sample	As	Cd	Cr	Cu	Pb	Hg	Ni	Zn	pesticides~
					(ppb)				
uina Bay									
RM 2.0	4	0.12	-	3	<1	<0.1	4	5.4	<0.01-<0.1
cheste~ ~ay									
c_ _site	23	<3	<5	<10	<2	<0.5	<20	<10	-
C*									
marine acute	69	43	1,100	2.9	140	2.1	75	95	.034-14
fresh acute	360	3.9+	16	18+	82+	2.4	1,400+	120+	0.06-1,050

WQC for pesticides is the range from lowest to highest WQC of the pesticides sought in the sample. Though not wn, none of the pesticides sought exceeded WQCs.
Water Quality Criterium (WQC) from EPA "Gold Book", May 1, 1996 EPA 440/5-86-001.

Figure 1. locations of sediment samples taken in the Federal Channel and South Beach Marina.